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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

CHUAN-BAO WANG et al

Group Art Unit: 1743

Examiner: Brian J. Sines

Serial No.: 09/771,882

Filed: January 30, 2001

For: POISON RESISTANT COMBUSTIBLE GAS SENSORS AND METHOD FOR WARNING OF POISONING

**RESPONSE**

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

The following remarks are submitted in response to the Office action mailed July 22, 2004.

Claims 1 through 4 and 6 through 14 have been rejected under 35 USC 103(a) over Jones et al in view of Friese et al.

The invention is directed to a poison resistant combustible gas sensing element comprising an electric heating element, a first layer coated on the electric heating element comprising a precious metal catalyst supported on a porous oxide and a second layer overlaying the first layer and

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comprising a catalytic compound which is not substantially active towards combustible gases, but which provides sites which are reactive with an which are capable of trapping gases and vapors which poison the precious metal catalyst. This catalytic compound is supported on a porous oxide.

The Jones et al patent discloses a combustible gas detection element comprising an electric heating element or filament having a coating layer of a precious metal oxidation catalyst supported on a porous oxide, and optionally layer of catalytic reactive material and/or inactive non-catalytic porous material which serves as a molecular filter. While the Office action concedes that Jones et al do not specifically teach the incorporation of the coating layer structural configuration adapted to function in the manner as recited in Claim 1, Friese et al has been cited to teach a gas sensor comprising a porous ceramic coating comprised of at least two layers, the first layer 12 comprising a precious metal catalyst supported on a porous oxide, and the second layer 14 overlaying the first layer comprising a catalytic compound which is not substantially active towards combustible gases, but which provides sites reactive with and capable of trapping gases and vapors which poison the precious metal catalyst.

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Applicants disagree with this assessment of the Friese et al reference. First, it is layer 11, not layer 12, which contains the platinum catalyst in $Y_2O_3$-stabilized $ZrO_2$ powder. Layer 12 is a porous layer comprising zirconia and alumina, and which does not contain a catalyst.

Layer 14 is described by Friese et al as being made of mixed oxides which are able to trap various contaminants usually occurring in the exhaust gas, for example silicon, phosphorous, zinc and lead. This layer is applied by immersing the sintered layer system 10, 11 and 12 in an equimolar solution of lithium nitrate and aluminum nitrate at room temperature. The solution is then allowed to drip off. As Friese et al states, "the porous covering layer 12 can be virtually completely impregnated during the process cycle as a result of capillary forces. In a subsequent process step, the layer system 10, 11, 12 is heat-treated in air for two hours at 1000°C so that the lithium aluminum mixed oxide can form from the nitrates in and on the porous covering layer 12." (column 3, lines 24-31). While layer 14 of Friese et al and the outer layer of the claimed invention have a similar purpose, trapping catalyst poisons, the method of preparation of the outer layer of Friese et al makes it entirely inappropriate for use in the claimed invention. Because layer



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14 of Friese et al is prepared by an impregnation method, the solution is adsorbed into the bulk of the layer system and in the subsequent heat treatment, the lithium aluminum mixed oxide is formed inside the layer system and not as a physically separate layer. According to the invention, the outer layer is formed in a manner which results in a physically separate layer.

Lithium is known as a catalyst poison for noble metal combustion catalysts, such as those used by Friese et al. However, the impregnation method of Friese et al results in the lithium aluminum mixed oxide penetrating directly to the catalyst surface in a manner which would result in blocking active catalyst site and poisoning the catalyst. Thus, preparing an outer layer according to the Friese et al teaching for use in the claimed invention, or in the invention of Jones et al, would result in a combustion catalyst which functions poorly. This is not a problem with Friese et al, since Friese et al relates to a sensor which does not use catalytic combustion for gas detection, but rather the solid electrolyte fuel cell principle to detect exhaust gases.

Thus, incorporating the teaching of Friese et al in the disclosure of Jones et al does not result in the claimed

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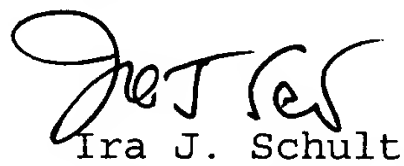
invention, but rather in an article which could not be used for the purposes of the claimed invention.

Withdrawal of this rejection is requested.

Claim 5 has been rejected under 35 USC 103(a) over Jones et al and Friese et al and further in view of Cheng et al, which has been cited to show an electric film heater. While Cheng et al discloses the use of an electric film heater with a gas sensor, it does not otherwise cure the defects of the Friese et al and Jones et al references. Withdrawal of this rejection is requested.

In view of the foregoing remarks, Applicants submit that the present application is now in condition for allowance and an early allowance of the application is earnestly solicited.

Respectfully submitted,



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